

# Program Structures & Algorithms

## Spring 2022

### Assignment No. 3

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#### ➤ Tasks:

- Implemented the height-weighted Quick Union with Path Compression.
- Checked all the unit tests for the height-weighted Quick Union with Path Compression.
- Wrote the implementation of UF\_HWQUPC which works as a client code
- Deduced the relationship between the number of objects ( $n$ ) and the number of pairs ( $m$ ) generated to accomplish this (i.e. to reduce the number of components from  $n$  to 1).

#### ➤ Relationship Conclusion:

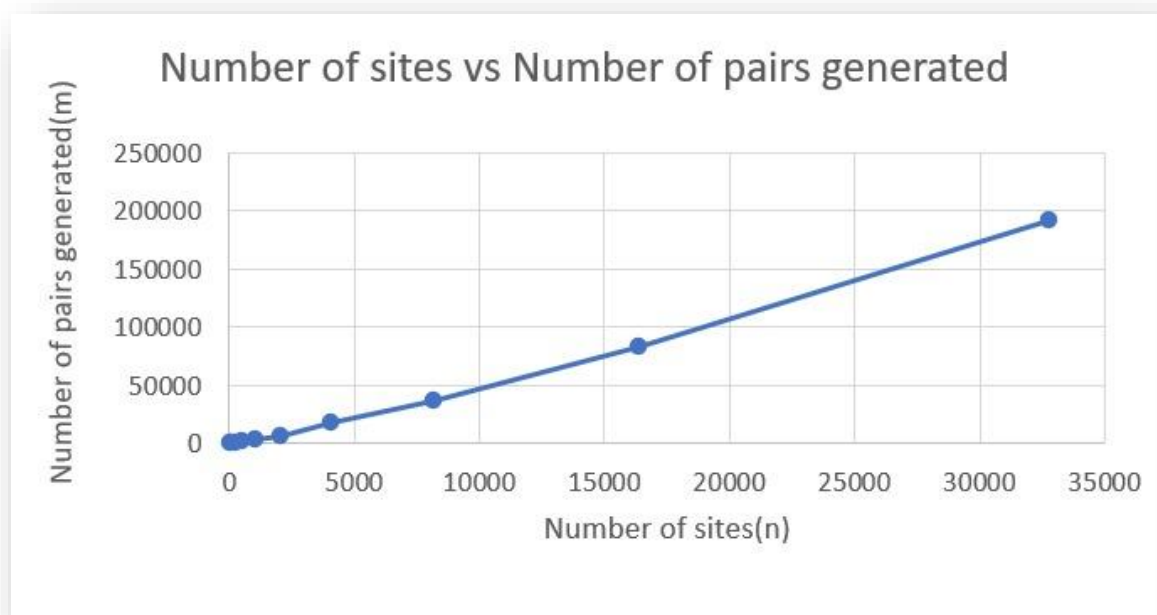
- Observings the output of the program , I have concluded that the relationship between the number of objects( $n$ ) and the number of pairs( $m$ ) generated is nearly equal to  $m = n \left( \frac{\log(n)}{2} \right)$

i.e if there are 512 components in the Quick Union, approximately 1664 random pairs are generated to accomplish the singular component condition.

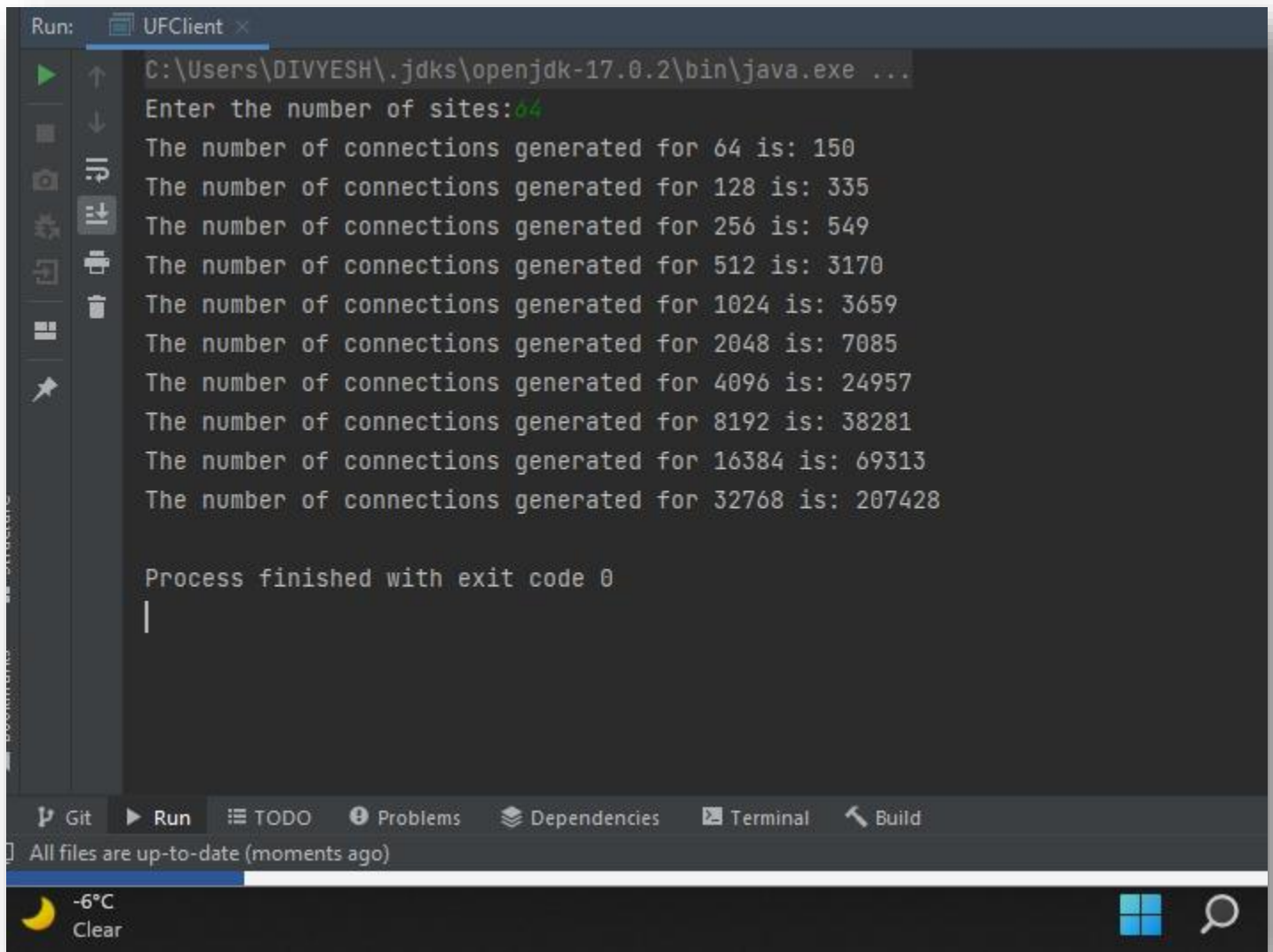
## ➤ Supporting Evidence for the conclusion :

### 1. Graphical Representation :

Number of Sites (n)	Number of pairs generated(m)
64	151
128	355
256	675
512	1678
1024	2989
2048	6585
4096	17726
8192	37477
16384	83107
32768	191448



## 2. Output of the Program:



```
Run: UIClient x
C:\Users\DIVYESH\.jdk\openjdk-17.0.2\bin\java.exe ...
Enter the number of sites: 64
The number of connections generated for 64 is: 150
The number of connections generated for 128 is: 335
The number of connections generated for 256 is: 549
The number of connections generated for 512 is: 3170
The number of connections generated for 1024 is: 3659
The number of connections generated for 2048 is: 7085
The number of connections generated for 4096 is: 24957
The number of connections generated for 8192 is: 38281
The number of connections generated for 16384 is: 69313
The number of connections generated for 32768 is: 207428

Process finished with exit code 0
|
```

Git Run TODO Problems Dependencies Terminal Build

All files are up-to-date (moments ago)

-6°C Clear

## ➤ Unit Test Results:

